MARYLAND AGRICULTURAL EXPERIMENT STATION IN ACCOUNT WITH REGULATORY AND PUBLIC SERVICE FUNDS

Dr.	Biological Laboratory	Seed Inspection	State Dairymen's Association
Receipts for year 1928-1929	$15,239.93	$9,711.41	$5,785.04
Cr.			
By Salaries	$3,760.95	$7,836.70	$2,790.79
Labor	950.00	195.63	......
Stationery and Office Supplies	16.04	384.98	......
Scientific Supplies	649.44	13.39	......
Feeding Stuffs	303.55	......	......
Sundry Supplies	5,832.68	216.79	......
Communication Service	564.43	121.50	......
Travel Expenses	......	248.98	399.14
Transportation of Things	43.42	......	......
Heat, Light, Water and Power	148.39	......	......
Furniture, Furnishings and Fixtures	15.05	598.77	......
Library	......	22.38	......
Scientific Equipment	107.00	201.83	......
Tools, Machinery and Appliances	35.74	4.61	......
Buildings and Land	40.26	54.23	......
Contingent	......	10.00	2,400.00
Totals	$12,466.95	$9,909.79	$5,589.93
Overdraft July 1, 1928	3,648.13	714.17	250.00
	$16,115.08	$10,623.96	$5,839.93
Overdraft June 30, 1929	875.15*	912.55*	54.89*
Totals	$15,239.93	$9,711.41	$5,785.04

*Due from State Treasurer.

The Forty-Third Annual Report

OF THE

UNIVERSITY OF MARYLAND

Agricultural Experiment Station

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1929-1930

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The University of Maryland
Agricultural Experiment Station

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Elizabeth Shank, Assistant.

The Station is located on the B. & O. R. R., City and Suburban Electric Car Line and the Baltimore-Washington Boulevard, eight miles north of Washington, D. C. Bell Telephone—Berwyn Exchange.

Visitors will be welcome at all times, and will be given every opportunity to inspect the work of the Station in all its departments.

The Bulletins and Reports of the Station will be mailed free of charge, to all residents of the State who request them.

ADDRESS:
AGRICULTURAL EXPERIMENT STATION,
College Park, Maryland.

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UNIVERSITY OF MARYLAND
AGRICULTURAL EXPERIMENT STATION

Volume 43 1929-30

THE FORTY-THIRD ANNUAL REPORT OF THE MARYLAND AGRICULTURAL EXPERIMENT STATION

For the fiscal year ending June 30, 1930

By H. J. Patterson, Director

To the Governor of Maryland, the Board of Regents, and the President of the University of Maryland:

Gentlemen: In accordance with the requirements of the Federal "Hatch Act" passed March 2, 1887, "Adams Act" passed March 16, 1906, and "Purnell Act" passed February 24, 1925, relating to and making appropriations for Agricultural Experiment Stations, there is submitted herewith a report upon the work and expenditures of the Maryland Station for the fiscal year ending June 30, 1930.

The 14 divisions of the Station have in progress at the present time 142 projects. A detailed list of these projects will be found in the forty-second annual report, pages XII to XVI.

PROGRESS OF INVESTIGATIONS.

The results obtained on some of the investigations were of sufficient importance to warrant their publication in bulletins. Some are in manuscript ready for publication. The following is a progress report on the work of the various departments:

AGRICULTURAL ECONOMICS:

This is a relatively new field of research at this Station. There are a great many problems pressing for solution and it is difficult to determine which should be given preference.

During the past year bulletins have been issued covering the most important phases of the canning industry and strawberry production.

During the year a study was started to determine the relative profits from different types of farming. The records have been made on 282 farms in six counties in the Piedmont Plateau and a like number on the Eastern Shore.

This study has shown that farm earnings are dependent upon the following factors: (1) crop yields, (2) kind of crops grown, (3) livestock efficiency, (4) efficiency of man labor, (5) efficient use of power machinery, (6) relation of investment in buildings to land, (7) relation of expenses to receipts, (8) adaptation of production to market demands and prices, (9) amount of livestock kept, (10) volume of business.

The contacts made in this study has caused many farmers to adopt a simple method of keeping farm cost accounts which has been devised for them by this department. This study will be continued for at least three and possibly five years so that the results may be averaged.

There have been 60 farms surveyed in connection with the project on the efficiency of the farm layout. It will be desirable to include at least 100 farms.

A study has already been made of 100 farms in connection with the system of leasing farms in Maryland. It will require at least two more years to complete this project. The object of this study is to determine if a plan can be devised which will more nearly meet the present day farm conditions and be equitable to both landlord and tenant.

The farm tax problem is being thoroughly studied. A review is being made of the practices in the various counties. The receipts and expenditures in the state and counties for ten years have been tabulated and analyzed. The assessment of various kinds of property in some counties for the past 20 years has been compiled. A study of the ratio of assessment to farm sales is underway. It is hoped that something can be developed which will be equitable to the farmer.

Tobacco Farming: The growing of this crop has been made the subject for a special study in organization and management. Cost records have been made on 300 farms. They were apportioned among the different counties and represent in the aggregate over 10 per cent. of the total acreage. In addition to cost of production, the study will include marketing and cover preparation for market, methods of selling, grading, distribution, consumption. It is hoped that this investigation will suggest improvements that might be made at every stage of production and handling of the tobacco crop and that the trends in consumption will serve as a guide for the growers.

A quantitative study of the consumption of dairy products in Baltimore was made during the last half of June, 1930. Data on 2,000 families were compiled. This study was made in co-operation with the Baltimore Dairy Council and U. S. Department of Agriculture. Sixty-one zones were selected, so as to give a fair cross section of the city. The data are being tabulated and will probably be available soon.

The Co-operative Marketing Organizations in Maryland will be studied during the coming year. This will be done in co-operation with the Federal Farm Board. The object of the study is to determine the character and type of business and service now being conducted by the many scattered locals as a basis for the establishment of sound regional co-operatives.

New Projects Suggested:

As soon as funds and men are available, this department will make an economic study of the Poultry Industry and a Consumption Study of Maryland Canned Foods.

Agricultural Engineering:

The Station has made a small beginning in research in this subject by having two research assistants majoring in this field. One has made a study of the influence of the electric treatment of soil by the use of an electric plow. So far the results have been negative but it is a matter of sufficient importance to warrant attacking it from a different angle and in a different way. The other student has been working on the sterilization of milk by electric processes.

There are many problems for investigation in this department. Funds are not available to provide men and facilities for the work.

AGRONOMY (CROPS AND SOILS):

The Agronomy Department has under way a large number of projects covering the outstanding problems on the improvement of varieties, creating new varieties, fertilization and rotations with the staple crops and on the predominating soil types. Much progress has been made on these projects and reports covering some of them will soon be issued in bulletins.

Corn: The results with corn indicate that the variety "Golden Queen" is destined to replace "Reid's Yellow Dent" and "Johnson County White" because of giving better yields, particularly on uplands and the poorer soils. A bulletin will soon be issued on varieties of corn for silage.

The variety and fertilizer tests in Western Maryland on corn to procure data in preparation for the advent of the "Corn Borer" shows that only early maturing varieties may be planted late on the uplands of Washington and Frederick Counties. The use of fertilizers to hasten the maturity of large late maturing varieties does not seem to be practical.

The breeding work with corn is making satisfactory progress and has developed some important factors in such work.

Sweet Corn: Another year's work with new variety "Hopeland," originated by this Station, substantiates its good yielding qualities and that from many angles it is decidedly better than the varieties usually grown in Maryland for canning. The breeding and selection for the refinement of "Hopeland" is being continued. Fertilizer tests with sweet corn have been conducted at College Park, in the Easton area of the Eastern Shore and in the Carroll-Frederick area. In all there were 144 plots in this test. There are no conclusive results but the trend indicates that the usual ratios of plant food used are not the best and that fertilizers have a marked influence on rate of maturity, percentage of husk and cob and toughness of corn, as well as of yield. The sweet corn investigations have given some new indication on the manner of the formation and storage of starch and sugars.

Wheat: The selections developed from Leap's wheat continue to give much promise. This year's yield would suggest that it has much merit and that it should be named and registered. The Currell-Mammoth-Red hybrid gives promise of value.

The crop estimate division of the U. S. Department of Agriculture are using, in part, the results of this Station's Environmental Wheat data in estimating the wheat yields for this section and report that they were at least four bushels per acre nearer the true yields than the old method they used would have given. A full use of the data would probably have made the estimate still nearer the actual.

Barley: The area devoted to winter barley in Maryland is growing rapidly as it will yield per acre more dairy and hay feed than wheat and fits well into the usual rotation. The new hybrids produced by crosses of Tennessee Winter and Velvet, made in 1926, indicate some valuable smooth-awned varieties which are quite hardy and give promise of satisfactory yielding capacity.

Forage Crops: Tests in 1929 of the source of seed of red clover gave the following air-dry, weed-free yields:

	Tons Per Acre
Maryland seed from strain grown on one farm for 16 years	1.47
Maryland seed (lowest yielding strain)	1.36
Pennsylvania seed	1.31
Ohio seed	1.13
French seed	1.05
Russian seed	.73

Tests of alfalfa in 1929 at seven different points in this state and on both clay and sandy soils was in favor of Argentine alfalfa for clay soils and Cossac alfalfa for sandy soils.

Kansas seed outyielded Grimm on clay soils and on sandy soils the reverse. Arizona seed gave the lowest yield. It winter-killed badly and showed disease on the roots. These plots will be continued.

Lawn Grasses: Three years tests on lawn grasses showed that a soil acidity indicated by a pH value of 6.8 was most desirable. That a fertilizer with a plant food ratio of 2-2-1 was best. Fall seeding of lawn grasses was preferable to spring.

Soil Survey: All of the counties of Maryland have been soil surveyed but a few have had to be resurveyed as some of the earlier classifications have become obsolete. The resurveys will probably be completed in 1931.

Work is in progress to correlate the results of experiments with varieties of fertilizers, etc., with the surveys and make them have a tangible, practical application for the farmers. The publishing of these reports with maps in a convenient and intelligible form will be expensive. Field studies of the fertilizer requirements of soil types are in progress in Baltimore, Caroline, Charles, Prince Georges, Somerset, St. Marys and Washington Counties.

Special work is in progress in studying the effect of fertilizers on the quality and yield of early potatoes, sweet potatoes and tomatoes. The best yields of tomatoes was obtained from a combination of manures and superphosphate. The second best from a 4-8-7 fertilizer in which the nitrogen was furnished by nitrate of soda.

Farm Crops: The general farm crop of corn, hay. silage and soybeans has suffered from and was greatly reduced by weather conditions. during the growing season, of a severe hail storm followed by a drought.

ANIMAL AND DAIRY HUSBANDRY:

The results on a number of the projects will soon be issued in bulletins.

Supplementing a ration of corn with one-fourth of a pound of fish meal per day materially increases the rate of gain of hogs.

In some experiments in the production of early lambs. the best quality and the most economical gains were made with those produced by a Southdown ram crossed on Dorset Merino ewes. During the summer and fall months a large number of thin cull lambs come to Baltimore markets. These depress the market and will create a dislike for lamb by consumers. The poor quality is due in most instances to parasitic infestation, poor handling and feeding and inferior breeding. A feeding test with this class of lambs was conducted after they had been treated for stomach worms and other parasites. The results showed that in most instances lambs of this class could be fed to advantage and the quality of the carcass advanced several grades. This test will be continued another season.

The calf rearing and feeding tests reported in bulletin 319 were repeated with about the same results. A third test is under way with some modifications which promise to be improvements.

A study is being made of the effect of freezing on the vitamines of milk. This will be completed this summer and the results should be checked by children.

The tests of the use of sharp vs. dull freezer blades upon the quality of ice cream are much in favor of the sharp blades.

The experiments of this department in cooperation with the department of animal pathology on the control of contagious abortion are quite favorable to isolation. After one year only one cow, which was partial, has been taken from the negative to the positive herd.

Two cows are being fed fish meal, high in iodine content, to note its effect on flavor, odor and iodine content of the milk.

Further experiments are under way on milk drinks of different flavors. This work gives promise of some commercial importance in order to meet the demands of different tastes.

There are many problems in Dairy and Animal Husbandry pressing for solution that can not be undertaken with the limited force and facilities available. This department needs more land, animals, equipment and men specially trained for this class of investigations.

ENTOMOLOGY:

Not much progress was made on a direct control of the Oriental Peach Moth last year. Similarly, in eight other states working on the same problem no direct control was developed. Considerable data was accumulated on the effect of late summer sprays in the field and upon a variety of spray materials in the laboratory. Much data on apple infestations and parasites were secured.

At the present time, the effect of sub-zero temperatures is being studied and the penetration or occlusion of hibernaculae. Fundamental studies on the behavior of all stages have been suggested for the coming year.

Progress is being made on many phases of the corn ear worm project, especially along the insecticidal control which was emphasized last year. These studies and behavior of newly hatched larvae will be stressed this season.

The ozone project is being carried out. Active work on this project is about to be instituted again.

The Mexican Bean Beetle project yielded some excellent data on time and costs for dusting and spraying, comparative results on field spraying and dusting under commercial conditions, and results from twenty dusting and spraying plots using a variety of materials.

Data on plum curculio emergence and abundance with relation of phenological occurrences has been obtained at Hancock over a two year period.

Dr. Langford is conducting tests to determine the relation of temperature and moisture to the development of the potato tuber moth.

Mr. Siegler, as a graduate student, obtained data which he presented as a thesis on the minimum temperatures under which codling moth larvae would survive, the temperatures running to 45° below zero.

New problems that will probably need attention this year may be the Argentine ant, newly discovered in Clifton Park greenhouses, Baltimore; the potato tuber moth, which threatens owing to the extensive potato planting in the lower Eastern Shore and the probable carry-over of the pest from last year's seed crop; the codling moth situation in certain Eastern Shore orchards; and the Japanese Beetle infestation at various points.

ANIMAL PATHOLOGY AND BACTERIOLOGY:

This department of the Station was created by the enactment of a law providing the preparation and distribution of hog cholera serum and other biological preparations for use with animals. The law also provided for general research with animal diseases. The work has broadened from year to year and now includes a variety of research touching these fields, the preparation of legume inoculum, much work of a regulatory character and all the University teaching in bacteriology and veterinary medicine.

The following biologics have been prepared and distributed, or distributed only:

Autogenous bacterins—prepared and distributed......	33,615 c.c.
Tuberculin, prepared and distributed................	16,415 c.c.
Avian tuberculin, prepared and distributed...........	3,500 c.c.
Johnin, prepared and distributed.....................	1,000 c.c.
Legume inoculum cultures, prepared and distributed..	6,898 tubes
Chickenpox vaccine, distributed......................	30,000 doses
Anti-hog-cholera serum, distributed..................	545,900 c.c.
Hog cholera virus, distributed.......................	2,010 c.c.

Numerous other articles were also distributed, such as disinfectant, syringes, thermometers, needles, etc.

Research Work: The research has not progressed as fast as it was hoped owing to changes in personnel and the interruptions caused by remodeling and making additions to the laboratories. These laboratory changes will increase and improve the facilities for work. The following is a brief statement of the status of the different projects:

D-24. The determination of the Lethal dose for poultry for certain drugs. This is dormant at present owing to the transfer of the chemist to another department and on other work. It will be resumed as soon as a chemist can be assigned to the work.

D-25. Determining practical methods of preventing infection from animals giving the positive reaction to the Bang Disease. Fair progress and satisfactory results have been obtained under varying conditions with four herds in different parts of the state. The indications are that the spread of the disease can be controlled without resorting to drastic measures.

D-26. Tests of intravenous antiseptics to kill the germs in positive reacting animals. Mercurochrome, Acriflavine, Kollo-Karbo and Metaphin have been used. Under the conditions which have obtained the results so far have been negative.

D-27. The effect of temperature, age and shipment on the agglutination titre of blood. The results show definitely that blood samples lose titre when held for more than 24 hours in hot weather unless iced or preserved. The details will be published soon in the Cornell Veterinarian.

D-28. A study of Blackhead in turkeys. The results so far are somewhat conflicting. The disease is easily transmitted from chickens to turkeys and by contaminated soil. There is some indication of an intermediate host. The removal of the sacca appears to prevent the disease, but this is probably not practical.

D-29. A study of the agglutination test for Bang Disease and the susceptibility of other farm animals to the disease. The results of transmission tests are mostly negative.

D-30. A study of diseased tonsils removed from people drinking raw milk. 90 pairs have been examined. The Bang disease has been isolated in two cases.

D-31. A study of the economics of clean and infected Bang disease herds. Data in three herds have been compiled; no conclusions worked out.

D-32. A survey of the relation of reacting animals to udder infection. Data gathered but no conclusions.

HORTICULTURAL DEPARTMENT:

Pomology: Some promising new varieties of pears have been developed in the breeding work from the crosses of Seckel, Kieffer, Duchess and Argon made in 1908 and 1912.

The study of the factors influencing annual bearing of apples indicates that it is dependent upon the supply of available nitrogen very early in the spring. The fruit spurs for the next year is completed within two weeks after blossoming. It has not been possible to control biennial bearing but the use of nitrogenous fertilizers in conjunction with proper pruning, thinning, pollination and soil management can modify this to a large extent.

Nitrogen on most soils has had more influence on the production of apples and peaches than any other plant food. In one orchard at Mt. Airy the addition of potash and phosphuric to the nitrogen greatly increased the yield of peaches and the growth of the trees. Sod orchards when fertilized with 15 lbs. of nitrate of soda per tree have done as well as clean cultivation and cover crops.

Results on pollination studies show that about two-thirds of the apple varieties in Maryland are self-sterile. Many pear and cherry varieties are also self-sterile. Most peaches, with the exception of J. H. Hale and June Elberta, appear to be self-fertile. Elberta, Belle of Georgia and Early Elberta are recommended as pollenizers for J. H. Hale.

The 20 year old peach orchard which was rejuvenated by pruning ten years ago continues to be satisfactory and gives promise of crops for several years more.

In the variety tests several new apples give promise of commercial importance for Maryland.

Tests at College Park show that apple trees can be planted at any time from late fall until growth starts in the spring. Peach trees did best when planted in the early spring.

Nitrogen had no detrimental effect on the keeping or shipping qualities of fruit. No direct or constant effect on shipping or keeping qualities of apples, peaches or strawberries could be attributed to any plant food. Some of the grapes resulting from breeding work give promise of commercial importance.

Vegetables:

Potatoes: Some new crosses with McCormick which have been isolated give promise of being resistant to mosaic.

Cauliflower: Experiments show that warm conditions are desirable for producing plants, but good heads will not form in a mean temperature above 55° F.

Cabbage: Seed production in this section has not proven successful on account of the difficulty of securing favorable isolated locations for the growing of the seed and keeping it free from seed-borne diseases.

Cantaloupes: By seed selection a melon has been developed which possesses many desirable qualities, flesh of good, sweet flavor and color, small seed cavity, outside attractive and netted. The melons with pointed ends were inclined to crack badly in wet seasons, while those with flat ends did not. By selecting seed from melons with flat ends the cracking has been almost entirely eliminated but the size of the seed cavity is somewhat larger than in the oval melons.

Bulletins have recently been issued giving the results of data on tomatoes, spinach, peas and sweet potatoes.

Floriculture:

Breeding work in progress with carnations, snapdragons, give promise of overcoming some of the difficulties experienced in growing these flowers.

Gladiolus investigations for winter bloom give indications that there are classes or varieties that require a long day and others which require a short day. The long day kinds are not suitable for forcing in the greenhouse.

Plant Propagation:

Tops from one year old apple seedlings rooted easily while tops on older seedlings did not grow well. The per cent to root decrease with the increase in age. The same conditions obtained with other plants. The rooting of cuttings decreases as the age of the tree from seed increases. Etiolation of apple shoots promoted rooting at that point.

Temperature seems to be an important factor in rooting cuttings. The optimum temperature (85° F) is probably higher than commonly used by propagators.

Plant Pathology and Botany:

The study of the distribution and classification of Maryland grasses has been completed and prepared for publication as a bulletin. A workable key has been prepared for the identification of grasses before flowering and without the necessity of a lens.

Some points have been cleared up during the year on the occurrence, means of spread and control of tomato mosaic.

An index of over 500 species of mycosphaerella has been prepared during the past year.

A method has been developed that will insure practically disease free potato seed for Maryland growers. This has greatly increased the demand for the inspection and certification of seed.

The dusting of seed wheat for the control of smut has been used extensively. It is to be used with oats and barley.

A strain of Alaska pea has been developed that is resistant to root rot. It is to be called Maryland Alaska. A seed producer has taken some of the stock for multiplication on a commercial basis.

The work with bean anthracnose indicates that it overwinters on diseased plants and in the soil in Maryland.

As soon as funds are available there is need for some investigations on the diseases of hardy perennials, shrubs and other ornamentals. Some work should also be conducted on the diseases of grass and forage crops.

Plant Physiology:

Some data have been gathered by this department in connection with the respiration of vegetables which will form the basis of some valuable contribution on the practical handling and storage of vegetables.

The age of the vegetable has a marked influence on the respiration. This suggested that the period of greatest peril immediately follows their harvest.

Supplementary to the work published in a recent bulletin on the relation of pectic constituents in tomatoes to the quality of the canned product a study is being made on the effect of defoliation and other factors on the quality of the tomatoes.

The studies on the relation of light to salt balance in nutrient solutions for plants developed that the actual percentage of potassium was greater in shaded than in unshaded plants. "Russell suggests that there may be a relation between sunshine and potassium fertilization with tomatoes and other plants."

This department is co-operating with the Smithsonian Institution in making some quantitative studies on light and wave-length on plants.

The work conducted by this department on the symptoms of mineral nutrient deficiencies in plants has created wide-spread interest and has been noted in popular and scientific journals and books.

Poultry Department:

This is the fifth year of the Egg-Laying Contest. A mass of data has been accumulated on the relation of various factors to egg production. This data will be compiled for publication at the end of the contest. Much data has been gathered on problems of management in relation to disease control. The data indicates that such troubles as watery whites in eggs, blood spots in eggs, roup, chickenpox and parasitic infestations can largely be controlled by management.

In some diseases it appears as though strains of birds could be developed which would be largely resistant.

A number of general tests and observations are in progress, such as poultry house floor insulation, design of feeders and watering devices.

This department could use a much larger plant and equipment to advantage in solving the problems. The investment in and profits made from poultry would justify more work in this field.

Seed Laboratory:

This department devotes its entire energies to the inspection of farm seeds offered for sale in this state. There has been a marked improvement of the quality of seed sold since the inception of the work. Seed inspection should be extended so as to include garden seeds, at least those sold in larger quantities to the market garden and canning trade.

That the work of this laboratory is being appreciated is evidenced by the increasing number of samples received from farmers as shown by the following figures for the years ending June 30:

1928	902	samples.
1929	1408	"
1930	1925	"

The present organization of the laboratory and volume of work enables reports to be made fairly promptly. If the number of samples continue to increase it will soon become more than the present force and facilities can handle.

The laboratory should be provided with some special refrigerating apparatus to be used in connection with the germination work, in order to improve the quality and efficiency of some phases of these tests.

There are many matters in connection with seeds that should be made the subject of investigation. This laboratory could use to advantage a substantial sum for research. The following are some of the problems which need investigation:

1. Drill surveys (To determine the character of the seeds actually being used, as distinguished from that available for use.)
2. Annual quality surveys (To determine the quality of home grown seeds.)
3. A survey of the vegetable seeds sold throughout the state.
4. The magnitude and causes of variations among purity analyses, noxious weed seed content and germination tests.
5. The determination and the use of tolerances as applied to variations of analyses and tests in the laboratory and as applied to reporting the result of work with collected samples.
6. The correlation of germination tests made in chamber, greenhouse and field.
7. The prevalence of seed borne diseases.
8. The practical relation of the "Seeding Value Index" to the rate of seeding.
9. The determination of conditions best suited to the storage of seeds.
10. The development of laboratory apparatus.

Ridgely Farm Sub-station:

This farm continues to serve as supplementary for the various departments and enables much to be done under Eastern Shore soil and climatic conditions. The central location of this farm also enables the farmers of the Eastern Shore to see some of the work in progress.

During the past year there was an extensive series of plots laid out to determine the use of green manures in growing canning crops. The past spring there was a small area on the northeastern portion of the farm, unsuitable for plots or crop experiments, set to Loblolly pines. There were 550 pines set at 6 foot intervals each way. This was done in co-operation with the State Department of Forestry as a demonstration.

Investigations of Special Importance:

There are many matters which should be made the subject for new investigations and many of the projects now under way should be expanded and pushed more vigorously.

Pasture and Hay Grasses:

There are nearly 900,000 acres devoted to grass crops in Maryland. This is the largest area in the state in one kind or class of crops. The future of the economic production of animals and animal products will be largely dependent upon the production of more and better pasture and hay grasses.

Many European and American experiments have shown that the selection of suitable grasses and its proper care and fertilization will make possible the production of more than double the food it is now yielding. If the 500,000 acres of pastures in Maryland can be made to carry double the number of animals as at present, it would be a big factor in milk and meat production and would justify a liberal expenditure. The economic, recreational and artistic development of Maryland is closely associated with the growing of grass. More land and money should be provided for investigations on these crops. At least $10,000 per year should be available.

Grasses are outstanding agencies in economic land utilization and conservation. A judicious use of land for grasses can be made to materially contribute towards farm relief, the control of surpluses and promoting the health of animals and men. It is more or less waste effort to advise a reduction of crop areas unless some way is suggested at the same time to profitably utilize the area released.

Every county and district in Maryland has some land that is submarginal for cropping which should be either in pasture or forests. A careful and detailed survey should be made of these areas and investigations conducted as to the way they should be handled, the grasses suited to the different soils, climatic conditions and purposes.

The relation of grasses to summer showers is often the limiting factor in the production of feed at the critical season.

Areas for such investigations should be located in the mountains of Western Maryland, the hills of central Maryland, in Southern Maryland and the Eastern Shore.

Forestry:

There are a number of forestry problems which should be investigated. At the present time about three-fourths of the forest land in Maryland is on farms. This condition coupled with the probable use of some submarginal farm lands for forestry would seem to make this class of investigation a proper obligation of the Agricultural Experiment Station.

The State Forester suggests that the investigations in forestry be located at the Experiment Station so that they could be co-ordinated and correlated with the research of other departments.

The time of at least one man should be given to forestry investigations. It would also be necessary to supply land and other facilities.

Considering the rapid consumption of timber in the U. S. it is very necessary that a policy be inaugurated that will insure a future supply. The State should co-operate with the farmer and give him some inducements to put all marginal or submarginal land either in forests or grass. This would contribute towards farm relief and the reduction of surpluses and be a growing asset for the future.

Weed Control:

Weeds are exacting a heavy toll and tax from Maryland farmers. They are reducing yields, lowering quality and serving as breeding places for insects and plant diseases. We can with much profit emulate the farmers of many parts of Europe and make war on weeds that rob the farmer of the full reward of his labor.

A thorough study of weeds and weed control is important and will require attacking from several angles. It is a big farm management problem that will involve changes in rotation and cropping system. A man to handle the project with facility needs to have a basic training in farm management and coupled with it a good working knowledge of botany, plant physiology and plant and soil chemistry. It is a problem worthy of considerable effort and would justify the expenditure of from $5,000 to $10,000 per year for several years.

Budgeting of Farm Crops:

Some investigations and demonstrations should be conducted which will promote a better appreciation among farmers of the desirability of preparing and following to some extent a cropping budget in relation to the type of farming being pursued and income requirements. This is particularly needed where there is a change being made in cropping systems and new crops are to be grown. Such work, owing to variable and uncertain factors, can not be made exact but can be made very helpful.

Fur Farming:

The State Conservation Commission and the U. S. Department of Agriculture, Bureau of Biological Survey, advise that there is need for research covering many of the problems in connection with the propagation and rearing of fur animals in captivity. They would be glad to have this institution to co-operate with them in conducting research on these problems.

There is special interest in muskrat farming at present. In 1928 it was estimated that Maryland received about 2½ million dollars from the muskrats trapped on marsh lands. There are large areas of marsh land in this state which can probably be made to make the income from muskrats several times as great as at present.

There is also probably an opportunity to stimulate the production of other fur animals in other sections of the state on hill and mountain land.

Aquatic Plants:

In some parts of Europe attention has been given to a study of aquatic plants which serve as food for fishes. The results obtained would seem to indicate that some work of this kind would be worthwhile for Maryland, particularly the inland streams.

BULLETINS ISSUED DURING THE FISCAL YEAR 1929-30

The results of some of the projects have been published in the bulletins and articles listed below. There are several bulletins ready for press which have not been published for lack of funds.

	Pages
Bulletin 311—Fertilizer Studies and the Production of Sweet Potatoes. By Fred W. Geise	1-38
Bulletin 312—Variety Studies of Spinach. Fred W. Geise and H. B. Farley	39-68
Bulletin 313—Studies of Premature Flower Formation in Wintered-Over Cabbage. Victor R. Boswell	69-146
Bulletin 314—Field and Sand Culture Experiments on Fertilizing Asparagus. Thomas H. White and Victor R. Boswell	147-162

Bulletin 315—The Production and Marketing of Strawberries on the Eastern Shore of Maryland. W. E. Whitehouse, W. J. Hart and W. P. Walker.......... 163-218
Bulletin 316—Ground Versus Unground Soybean Hay for Dairy Cows. L. W. Ingham and DeVoe Meade.......... 219-230
Bulletin 317—Tests with Potato Seed from Various Sources. R. A. Jehle and E. I. Oswald.......... 231-254
Bulletin 318—Cannery Tomatoes—Results of Three Years' Tests of Varieties. Fred W. Geise.......... 255-276
Bulletin 319—Calf Feeding Investigations.—I—Raising Dairy Calves on Nurse Cow, Whole Milk, Remade Skim Milk and Calf Meal. By L. W. Ingham, DeVoe Meade and M. H. Berry.......... 277-302
Bulletin 320—Spinach for Canning—The Relation of Physical and Chemical Properties to Quality. F. W. Geise.......... 303-326

CONTRIBUTIONS TO SCIENTIFIC MEETINGS AND JOURNALS

Abrams, G. J. Honey as a Disseminator of American Foulbrood Spores. Md. St. Beekeepers' Assn. Rpt. Page 352-356. 1930.

Auchter, E. C. Adjusting orchard practices to meet market requirements. Ann. Rept. Md. Agric. Soc. Page 254-264. 1929.

Conrad, C. M. A Fundamental Process in the Ripening of Fruits. Paper presented before the University of Maryland Biological Society in Baltimore, March 14, 1930.

Conrad, C. M. A furfural-yielding substance as a splitting product of protopectin during the ripening of fruits. Plant Physiology 5:93-103. 1930.

Cory, E. N. Prevalence of Insects in the Fruit Crop of 1929. Pen. Hort. Soc. Rpt. 1929. Page 30-33.

Cory, E. N. Some Experiences with the Mexican Bean Beetle. Pen. Hort. Soc. Rpt. 1929. Page 18-20.

Cory, E. N. San Jose Scale, a Serious Menace. It Must Be Controlled. Rpt. of Md. St. Hort. Soc. 1930. Page 206-213.

Cory, E. N. Vegetable Insects of 1929. Md. Veg. Growers' Assn. Rpt. Page 389-393.

Cory, E. N. Flowering Plants, Shrubs and Trees for the Beekeeper. Md. St. Beekeepers' Assn. Rpt. Page 348-351.

Cory, E. N. and C. Graham. The Practicability of Hot Water Treatment for the Control of the Boxwood Leaf Miner. Journal of Economic Entomology, June, 1930, Vol. 23, No. 3. Page 563-565.

Cory, E. N. and P. D. Sanders, and W. T. Henery. Some Phases of the Mexican Bean Beetle Campaign. J. E. E., February, 1930, Vol. 23, No. 1. Page 146-149.

Degman, E. S. Firmness and keeping quality of fruits as affected by nitrogen fertilizers. Proc. Amer. Soc. Hort. Sci: 26: 182-187. 1929.

Fletcher, L. A. A preliminary study of the factors affecting the red color on apples. Proc. Amer. Soc. Hort. Sci: 26 191-197. 1929.

Gardner, F. E. Composition and growth initiation of dormant Bartlett pear shoots as influenced by temperature. Plant Physiol. 4:405-434. 1929. (Work done at California University).

Gardner, F. E. The relationship between tree age and the rooting of cuttings. Proc. Amer. Soc. Hort. Sci. 26: 101-105. 1929.

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Hunter, H. A. Seed-borne bean diseases. (Md. Canners' and Field Men's School Report.) The Canning Trade 52: No. 57:14. 1930.

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Jehle, R. A. Problems in the control of apple scab. Trans. Peninsula Hort. Soc. 19: 27-30. 1930.

Jehle, R. A. The Production of High Grade Potato Seed Stocks. Rept. Md. Veg. Growers' Assn. 12: 396-401. 1930.

Johnston, E. S. The plant's whimsical appetite. Scientific American 142: 226-227. March, 1930.

Johnston, E. S. The essential nature of boron to the growth and fruiting of the tomato. Plant Physiology (in press). (Johnston and Fisher).

McConnell, H. S. *Parlatoria oleae* Colv., a Pest of Privet in Maryland. J. E. E., Vol. 23, No. 1. Page 142-145. February, 1930.

Notes on *Corythuca pallipes* Parksley, and *Leptodictya simulans* Heidmann (Heteropt: Tingitidae). Ent. News, Vol. 41, No. 4, Page 135, April, 1930.

McCreary, D. *Dicylomonia Julianis* Walk. Predatory upon Bagworm Eggs. To be published in J. E. E.

Moyer, A. J. Studies in the growth responses of fungi to iron, manganese and zinc.

Munkwitz, R. C. Sharp Versus Dull Freezer Blades. Annual Report International Assn. of Ice Cream Manufacturers. 1929.

Munkwitz, R. C. A Method of Processing Chocolate Milk to Reduce Sedimentation. Annual Report of American Dairy Science Assn. September, 1929.

Norton, J. B. S. Prize Winning Dahlias. Nat. Hort. Mag. 9: 48-49. 1929.

Norton, J. B. S. Maryland Grasses.

Schrader, A. L. The effect of nitrogen fertilization on other orchard practices. Trans. Penin. Hort. Soc. 1929.

Schrader, A. L. Color and size of peaches as influenced by pruning and thinning. Ann. Rept. Md. Agric. Soc. Page 153-158. 1929.

Weinberger, J. H. The effect of various potash fertilizer on the firmness and keeping quality of fruits. Proc. Amer. Soc. Hort. Sci: 26: 174-180. 1929.

Wentworth, S. W. Further evidence of the variability of apple pollen as determined by the spur-unit method. Proc. Amer. Soc. Hort. Sci. 26: 43-48. 1929. (Work done at Cornell).

Woods, M. W. Preserving Certain Green Algae in Natural Colors. Science 70: 637. 1929.

STATION STAFF

Several of the research assistants (graduate students) have completed their work for advanced degrees and accepted positions elsewhere on full time and full pay. Their places have been filled by other research assistants.

W. J. Hart, M. S., was given a leave of absence to make a survey of the wheat marketing situation in Maryland, Pennsylvania, Delaware, and Virginia for the Federal Farm Board. At the end of the period for this special survey the Federal Farm Board offered him a permanent position which he accepted. This vacancy has not been filled.

F. E. Gardner, Ph. D., associate in plant propagation, resigned to accept a similar position with the U. S. Dept. of Agriculture at a very substantial increase in salary and opportunities. Dr. Gardner is to have his headquarters at this Station and continue to direct this phase of our work.

M. H. Berry, M. S., of this University was appointed to a permanent place on our Dairy Research Staff after completing his work for the M. S. degree.

FINANCIAL REPORTS

The following statement gives the relative amount expended for different phases of the Station work:

General Overhead	15.1%
Administration	5.0%
Agronomy	20.0%
Horticulture	17.0%
Animal and Dairy Husbandry	14.7%
Poultry	9.3%
Botany and Plant Pathology	2.4%
Entomology	4.0%
Home Economics	1.7%
Plant Physiology	5.6%
Pathology and Bacteriology	3.0%
Ridgely Farm	2.2%
	100.0%

REPORT ON EXPENDITURES

MARYLAND AGRICULTURAL EXPERIMENT STATION IN ACCOUNT WITH THE UNITED STATES APPROPRIATIONS

Dr.	Hatch Fund	Adams Fund	Purnell Fund
To Appropriations for fiscal year 1929-1930	$15,000.00	$15,000.00	$60,000.00
Cr.			
By Salaries	14,974.00	14,766.66	41,943.88
Labor	....	....	4,656.19
Stationery and Office Supplies	....	1.85	408.92
Scientific Supplies, consumable	....	103.75	1,460.47
Feeding Stuffs	....	7.50	1,228.33
Sundry Supplies	....	25.69	438.89
Fertilizers	....	23.11	291.85
Communication Service	26.00	10.19	41.13
Travel Expense	....	17.75	5,095.06
Transportation of Things	....	....	1.75
Publications	....	....	136.75
Heat, Light, Water and Power	....	....	5.68
Furniture, Furnishings, Fixtures	....	....	2,094.80
Library	....	....	15.62
Scientific Equipment	....	43.50	1,178.20
Livestock	....	....	110.00
Tools, Machinery and Appliances	....	....	892.48
Buildings and Lands	....	....	....
Contingent Expenses	....	....	....
Total	$15,000.00	$15,000.00	$60,000.00

MARYLAND AGRICULTURAL EXPERIMENT STATION IN ACCOUNT WITH REGULATORY AND PUBLIC SERVICE FUNDS

	Biological Laboratory	Seed Inspection	State Dairymen's Assn.
Dr.			
Receipts for year 1929-1930	$11,207.90	$10,221.07	$3,569.29
Cr.			
By Salaries	$ 3,437.86	7,918.39	$3,703.82
Labor	1,175.04	993.75	....
Stationery and Office Supplies	64.00	100.00	....
Scientific Supplies	610.19	148.34	....
Feeding Stuffs	362.60	0.00	....
Sundry Supplies	2,141.99	121.17	....
Communication Service	393.04	79.20	....
Travel Expenses	0.00	370.39	160.58
Transportation of Things	72.64	5.07	....
Heat, Light, Water and Power	541.71	0.00	....
Furniture, Furnishings and Fixtures	27.95	0.00	....
Library	0.00	3.32	....
Scientific Equipment	0.00	129.22	....
Tools, Machinery and Appliances	46.90	94.30	....
Buildings and Land	231.02	0.00	....
Contingent	2.00	10.00	....
Total	$ 9,106.94	$ 9,973.15	$3,864.40
Overdraft July 1, 1929	875.15	912.55	54.89
	$ 9,982.09	$10,885.70	$3,919.29
Credit June 30, 1930	1,225.81	....	....
Overdraft June 30, 1930		664.63*	350.00*

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*Due from State Treasurer.

MARYLAND AGRICULTURAL EXPERIMENT STATION IN ACCOUNT WITH THE STATE APPROPRIATIONS

	General Fund	Ridgely Farm
Dr.		
Receipts for year 1929-1930	$66,838.43	$4,892.96
Cr.		
By Salaries	$27,665.34	$1,804.50
Labor	12,627.26	2,167.42
Stationery and Office Supplies	321.21	0.00
Scientific Supplies	761.96	0.00
Feeding Stuffs	9,012.90	28.20
Sundry Supplies	1,941.10	263.15
Fertilizers	1,313.73	3.95
Communication Service	249.15	18.73
Travel Expenses	972.79	68.31
Transportation of Things	990.82	83.91
Publications	2,111.40	0.00
Heat, Light, Water and Power	1,959.04	13.90
Furniture, Furnishings and Fixtures	293.61	0.00
Library	639.50	0.00
Scientific Equipment	548.29	0.00
Livestock	110.00	0.00
Tools, Machinery and Appliances	2,382.39	117.38
Buildings and Land	1,590.89	12.90
Insurance	1,442.98	42.03
Contingent Expenses	117.31	0.00
Total	$67,051.67	$4,624.38
Overdraft July 1, 1929	3,567.44	103.73
	$70,619.11	$4,728.11
Overdraft June 30, 1930	3,780.68*	
Credit June 30, 1930		$ 164.85

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*Due from State Treasurer.

MARYLAND AGRICULTURAL EXPERIMENT STATION IN ACCOUNT WITH THE STATION FARM FUND

Dr.

Receipts 1929-1930	$31,300.24

Cr.

By Salaries	$ 793.45
Labor	17,854.50
Stationery and Office Supplies	51.89
Scientific Supplies	44.30
Feeding Stuffs	3,925.10
Sundry Supplies	1,111.71
Fertilizers	279.35
Communication Service	100.28
Travel Expenses	741.69
Transportation of Things	119.72
Publications	2,411.25
Heat, Light, Water and Power	575.48
Furniture, Furnishings and Fixtures	0.00
Library	4.00
Livestock	581.50
Tools, Machinery and Appliances	635.26
Buildings and Land	701.22
Insurance	0.00
Contingent	229.68
Total	$30,160.38
Overdraft July 1, 1929	3,019.01
	$33,179.39
Overdraft June 30, 1930	$ 1,879.15